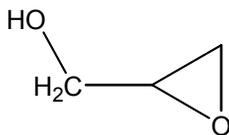


**GLYCIDOL**  
**CAS No. 556-52-5**

First Listed in the *Seventh Annual Report on Carcinogens*



## CARCINOGENICITY

Glycidol is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (NTP 1990, IARC 2000). Two-year studies were conducted with mice and rats that were administered glycidol by gavage. Male rats showed increased incidences of mesotheliomas of the tunica vaginalis, fibroadenomas of the mammary gland, gliomas of the brain, and neoplasms of the forestomach, intestine, skin, Zymbal gland, and thyroid gland. Female rats had increased incidences of fibroadenomas and adenocarcinomas of the mammary gland, gliomas of the brain, neoplasms of the oral mucosa, forestomach, clitoral gland, and thyroid gland, and leukemia. Male B6C3F<sub>1</sub> mice had increased incidences of neoplasms of the harderian gland, forestomach, skin, liver, and lung. Female B6C3F<sub>1</sub> mice had increased incidences of neoplasms of the harderian gland, mammary gland, uterus, subcutaneous tissue, and skin. Other neoplasms that may be related to the administration of glycidol were fibrosarcomas of the glandular stomach in female rats and carcinomas of the urinary bladder and sarcomas of the epididymis in male mice (NTP 1990).

No adequate human studies of the relationship between exposure to glycidol and human cancer have been reported (IARC 2000).

## PROPERTIES

Glycidol, C<sub>3</sub>H<sub>6</sub>O<sub>2</sub>, is a viscous, colorless liquid that boils at 160°C (HSDB 2001). It is soluble in water, alcohol, ether, acetone, benzene, and other organic solvents. At 25°C, the vapor pressure is 0.9 mm mercury (NTP 1990). Glycidol is combustible with a flash point of 72°C and is incompatible with strong oxidizers and nitrates. It explodes when heated, or in the presence of strong acids, bases, metals, or metal salts (HSDB 2001, NTP 2001).

## USE

In the 1950s, glycidol was used solely for research purposes; however, by the late 1970s, glycidol became widely used as a chemical intermediate in the pharmaceutical industry. Currently, glycidol is used as a stabilizer in the manufacture of vinyl polymers, and as an intermediate in the synthesis of glycerol, glycidyl ethers, and amines. Glycidol is also used as an additive for oil and synthetic hydraulic fluids, as a diluent in some epoxy resins, and as a dye-leveling agent. It is used in surface coatings, chemical synthesis, pharmaceuticals, sanitary chemicals, and sterilizing milk of magnesia (IARC 2000, HSDB 2001, NTP 2001). The glycidol structure is present in two commercially important groups of derivatives, glycidyl ethers and glycidyl esters, neither of which is prepared directly from glycidol. Glycidyl ethers are prepared on a commercial scale in a closed system. The end product is a mixed ether, one component of

which is the glycidyl group. Glycidyl esters are prepared by reacting the sodium salt of the appropriate carboxylic acid with epichlorohydrin. Both types of derivatives are used almost exclusively as diluents in epoxy resins (NTP 1990). Glycidol also falls into the generalized category of chiral epoxides. These chiral epoxides or glycidols can be used as reagents in a number of pharmaceutical and fine chemical applications. They include pesticides and herbicides, flavors and fragrances, chiral polymers, and liquid crystals (ARCO 1990).

## PRODUCTION

One domestic producer and 18 suppliers of glycidol were reported (IARC 2000, Chem Sources 2001). No recent production data were found. In the past, more than 10 million lb of glycidyl compounds were produced or imported annually into the United States (NTP 1990).

## EXPOSURE

The primary routes of potential human exposure to glycidol are inhalation, eye and dermal contact, and ingestion. Occupational exposure may occur through inhalation. The National Occupational Exposure Survey conducted by NIOSH from 1981 to 1983 estimated that in 88 facilities, covering 10 occupations, 4,871 workers, including 579 women, were potentially exposed to glycidol (NIOSH 1984, IARC 2000). This estimate was derived from observations of the actual use of the compound (78% of total observations) and the use of trade name products known to contain the compound. Glycidol is moderately irritating to the skin and mucous membranes; however, if absorbed through the skin, it can cause central nervous system stimulation, followed by depression (Merck 1996).

## REGULATIONS

EPA regulates glycidol under the Toxic Substances and Control Act (TSCA).

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a threshold limit value of 2 ppm (6.1 mg/m<sup>3</sup>) for glycidol. NIOSH has established a recommended exposure level (REL) of 25 ppm (75 mg/m<sup>3</sup>) for glycidol. OSHA has established a permissible exposure limit (PEL) of 50 ppm (150 mg/m<sup>3</sup>) for glycidol. OSHA also regulates glycidol under the Hazard Communication Standard and as a chemical hazard in laboratories. Regulations are summarized in Volume II, Table 92.

## REFERENCES

ARCO Chemical Company. Product Literature: Chiral Glycidols, Epoxy Alcohols. 1990.

Chem Sources. Chemical Sources International, Inc., <http://www.chemsources.com>, 2001.

HSDB. Hazardous Substances Data Bank. Online database produced by the National Library of Medicine. Glycidol. Profile last updated, May 15, 2001. Last review date, August 7, 1991.

IARC. International Agency for Research on Cancer. IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Some Industrial Chemicals. Vol. 77. 564 pp. Lyon, France: IARC, 2000.

Merck. The Merck Index, Twelfth Edition. Whitehouse Station, NJ: Merck & Co., Inc., 1996.

NIOSH. National Institute for Occupational Safety and Health. National Occupational Exposure Survey (1981-83). Cincinnati, OH: Department of Health and Human Services, 1984.

NTP. National Toxicology Program. Technical Report Series No. 374. Toxicology and Carcinogenesis Studies of Glycidol (CAS No. 556-52-5) in F344/N Rats B6C3F<sub>1</sub> Mice (Gavage Studies). NIH Publication No. 90-2829. 229 pp. National Toxicology Program, Research Triangle Park, NC, and Bethesda, MD, 1990.

NTP. National Toxicology Program. NTP Chemical Repository. Glycidol. Last updated August 13, 2001. (<http://ntp-server.niehs.nih.gov> and search 556-52-5).